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EXAMINER

ARANCIBIA, MAUREEN GRAMAGLIA

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/823,371
Filing Date: April 12, 2004
Appellant(s): SHANNON ET AL.

Alan Taboada
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 2 September 2008 appealing from the Office action mailed 1 April 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

JP 08-097199A	NISHIYAMA et al.	4-1996
JP 06-243992A	DEGUCHI et al.	9-1994
US 6,887,339	GOODMAN et al.	5-2005
US 6,641,149	SUEMASA et al.	11-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

Claims 1, 3, 4, 6, 7, 9, 10, 12-15, and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Kokai 08-097199A to Nishiyama et al. in view of Japanese Kokai 06-243992 to Deguchi et al. The following rejection refers to the Figures and English Translations of Nishiyama et al. and Deguchi et al.

Nishiyama et al. teaches an apparatus for matching the impedance of a pair of RF sources 16, 17 coupled to a single electrode 15 to the impedance of a plasma in a semiconductor substrate processing chamber 11 (Paragraph 12), comprising: a first sub-circuit 18 for matching the impedance of a first RF signal *having a variable frequency* (Paragraph 12) of between about 13.56 MHz to 40 MHz (Paragraph 19) generated by a first RF source 16 to the impedance of the plasma; and a second sub-circuit 19 for matching the impedance of a second RF signal *having a variable frequency* (Paragraph 12) of between about 10 kHz to 1 MHz (Paragraphs 20-21) generated by a second RF source 17 to the impedance of the plasma, the second sub-circuit connected to the first sub-circuit to form a common output that is coupled to the

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electrode 15. (Figure 1) Note that the ranges in frequency for the first and second RF signals as taught by Nishiyama et al. overlap with the claimed ranges, and thus meet the limitations as recited in the claims.

Further note that Nishiyama et al. teaches that the first and second RF sources 16, 17, are variable frequency power sources (*RF generators 16 and 17 of two variable frequencies*; Paragraph 12), and thus are structurally capable of both being simultaneously set to frequencies in the claimed ranges. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Also, a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

In regards to Claim 19 and 21, Nishiyama et al. does not teach that the first and second sub-circuits are structured such that a first match tune space defined by the first sub-circuit can be varied without affecting a second match tune space defined by the second circuit. Further in regards to Claims 1, 3, 9, 10, 12, and 20, Nishiyama et al. does not expressly teach the claimed features of the first and second matching sub-circuits.

Deguchi et al. teaches that a matching circuit 14 for a variable frequency RF source 12 should comprise a fixed set of series components and a variable shunt capacitor 22 connected to ground. (Figure 1; Paragraphs 13-16)

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It would have been obvious to one of ordinary skill in the art to modify each of the first and second matching sub-circuits for variable frequency RF sources 16, 17 taught by Nishiyama et al. to each comprise a matching sub-circuit having a fixed set of series components and a variable shunt capacitor, as taught by Deguchi et al. The motivation for making such a modification to each sub-circuit, as taught by Deguchi et al.

(Paragraphs 11, 19, 20, 30, and 31), would have been that the combination of such a matching sub-circuit with a variable frequency RF source allows the impedance of the RF signal to be matched to the impedance of the plasma quickly with fewer variable capacitors and overall smaller equipment size by varying the frequency of the RF signal generated by the RF source and by varying the shunt capacitance.

Further in regards to Claims 1, 3, 9, 10, 12, and 19-21, the apparatus taught by the combination of Nishiyama et al. and Deguchi et al. meets all of the structural limitations of the claimed invention, and would be structurally capable of performing the intended use of allowing the first match tune space defined by the first sub-circuit to be varied without substantially affecting the second match tune space defined by the second sub-circuit, by varying the variable shunt capacitors. (The Examiner refers to Paragraphs 20 and 21 of the instant Specification, which disclose that this intended use is performed in the manner just described as capable of being performed by the apparatus taught by the combination of Nishiyama et al. and Deguchi et al.) It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Also, a claim containing a “recitation with respect to the manner in

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which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

In regards to Claims 4 and 13, the match tune spaces of the first and second RF sources taught by the combination of Nishiyama et al. and Deguchi et al. would be structurally capable of being controlled by varying the frequency of the signal generated by one of the first and second RF sources taught by Nishiyama et al., which are variable RF sources as discussed above in regards to Claim 19. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Also, a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

In regards to Claims 6 and 14, the first and second sub-circuits taught by the combination of Nishiyama et al. and Deguchi et al. would be structurally capable of being fixed in a predetermined configuration prior to performing a process in the chamber, based on user control of the variable shunt capacitors and variable RF sources. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Also, a claim containing a “recitation with respect to

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the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

In regards to Claims 7 and 15, the apparatus taught by the combination of Nishiyama et al. and Deguchi et al. would be structurally capable of matching the impedance of the first and second RF sources to the impedance of the processing chamber during processing by varying at least one of the variable shunt capacitors of the first and second sub-circuits as taught by the combination of Nishiyama et al. and Deguchi et al. or by varying the frequency of at least one of the first and second RF sources taught by Nishiyama et al., which are variable RF sources as discussed above in regards to Claim 19. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Also, a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

In regards to Claims 17 and 18, see the discussion of Claim 19 above.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiyama et al. in view of Deguchi et al. as applied to Claim 1 above, and further in view of U.S. Patent 6,887,339 to Goodman et al.

The teachings of Nishiyama et al. and Deguchi et al. were discussed above.

The combination of Nishiyama et al. and Deguchi et al. does not expressly disclose the output impedance of the first and second RF sources.

Goodman et al. teaches that RF sources conventionally have a 50 Ohm output impedance. (Column 1, Lines 57-59)

It would have been obvious to one of ordinary skill in the art to use RF sources with a 50 Ohm output impedance, as taught by Goodman et al., in the apparatus taught by Nishiyama et al. and Deguchi et al. The motivation for doing so would have been to assemble the apparatus using standard (readily available) components.

Claims 8 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiyama et al. in view of Deguchi et al. as applied to Claims 1 and 10 above, and further in view of U.S. Patent 6,642,149 to Suemasa et al.

The teachings of Nishiyama et al. and Deguchi et al. were discussed above.

In regards to Claims 8 and 16, the combination of Nishiyama et al. and Deguchi et al. does not expressly teach the claimed isolation sub-circuit.

Suemasa et al. teaches isolation sub-circuits 118, 124 for preventing power supplied from either of the first and second RF sources 122, 128 from being coupled to the other of the first and second RF sources. (Column 4, Lines 1-3 and 11-13)

It would have been obvious to one of ordinary skill in the art to modify the apparatus taught by the combination of Nishiyama et al. and Deguchi et al to include isolation sub-circuits, as taught by Suemasa et al. The motivation for making such a modification, as taught by Suemasa et al. (Column 4, Lines 1-3 and 11-13), would have

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been to preventing power supplied from either of the first and second RF from being coupled to the other of the first and second RF sources.

(10) Response to Argument

In response to Applicant's argument that it is well settled law that structural elements may be defined functionally, Examiner is cognizant of this. However, a recitation of the intended use or function of the claimed invention must result in a *structural difference* between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use or function, then it meets the claim. In the instant case, the functional recitations in the claims have not been disregarded by Examiner. Rather, the rejection of the claims is based on the argument that the obvious combination of the teachings of Nishiyama and Deguchi would have all of the structural features of the claimed invention, and would be structurally capable of performing the recited functions. Furthermore, contrary to Applicant's assertions, Examiner has provided a cogent technical reasoning tending to show that the structure taught by the combination of Nishiyama and Deguchi would be structurally capable of performing the function recited in the claims of allowing the first match tune space defined by the first sub-circuit to be varied without substantially affecting the second match tune space defined by the second sub-circuit, *by varying the variable shunt capacitors*. The Examiner has additionally referred to Paragraphs 20 and 21 of the instant Specification, to point out that the instant disclosure describes the function of allowing the first match tune space defined by the first sub-circuit to be varied without substantially affecting the

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second match tune space defined by the second sub-circuit as being performed by the same action of *varying the variable shunt capacitors*. This citation to Applicant's Specification has been made to further show that the apparatus taught by the combination of Nishiyama and Deguchi is not just capable of performing the function recited in the claims, but literally capable of performing that function *in the same manner disclosed by Applicant*.

In response to applicant's arguments against the references individually, particularly that Deguchi et al. only teaches a single RF power supply and a single matching part, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

It is also noted that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

In regards to Applicant's arguments that the declaration under 37 C.F.R. 1.132 filed 17 September 2007 should be sufficient to show that the combination of Nishiyama et al. and Deguchi et al. fails to teach or suggest the claimed invention, Examiner must continue to disagree. The declaration attempts to show that fixed series elements in the

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respective tuning portions of a dual frequency match circuit do not *necessarily* provide respective tune space independence. As evidence, the declaration cites a Smith chart illustrating the divergent tune space graphs predicted by a modeling analysis for a dual frequency match circuit having fixed series components and a variable shunt to ground *“that does not comport with the principles of the present invention.”*

Examiner notes with appreciation Applicant's explanation that the comparison in the declaration is made with a dual frequency match circuit having fixed series components and a variable shunt to ground, and that the proprietary “parallel lump element match circuit analysis” was used to generate the Smith chart from the experimental data. However, this clarification notwithstanding, Examiner maintains that the declaration is insufficient to overcome the rejections based upon the combination of Nishiyama et al. and Deguchi et al.

Applicant argues that the declaration is intended to show, not that the claimed invention is non-obvious over the combination of Nishiyama and Deguchi, but rather that the combination of Nishiyama and Deguchi cannot be assumed to exhibit the structural capability of performing the functional recitations in the claims that a first match tune space can be varied without affecting a second match tune space. Therefore, Applicant argues that there was no intention to provide evidence in commensurate in scope with the claims, or to compare the claimed subject matter with the closest prior art, as that was not the purpose of the declaration. Examiner asserts that even taking this into account, the declaration is not sufficient to overcome the rejections based upon the combination of Nishiyama and Deguchi.

The declaration attempts to show that a dual frequency match circuit having fixed series components and a variable shunt to ground does not necessarily or inherently exhibit respective tune space independence. However, it cannot be determined from the declaration what characteristics the tested dual frequency match circuit had that “do not comport with the principles of the present invention,” and how such differences may relate to similar structural deficiencies in the apparatus taught by the combination of Nishiyama and Deguchi. The rejection is based on the *structural capability* of the apparatus of the combination of Nishiyama et al. and Deguchi et al. to perform in the same manner as the claimed invention, based on the *user control* of the variable shunt capacitors and the variable RF sources. The declaration is silent as to why the apparatus of the combination of Nishiyama et al. and Deguchi et al. would not be *structurally capable* of exhibiting the respective tune space independence of the claimed invention.

Put another way, Examiner remains unable to identify any structural differences between the combination of Nishiyama and Deguchi (or the tested deficient match circuitry cited in the declaration) and the claimed or disclosed invention that would prevent the structural capability of Nishiyama and Deguchi to perform the same functions as the claimed or disclosed invention. The claimed combination of Nishiyama and Deguchi teaches all of the structural limitations of the claimed invention, and therefore must be capable of performing the same functions to reach the same outcome. Applicant argues that the functional recitations of the claims impose further structural limitations to the claimed invention that the combination of Nishiyama and

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Deguchi do not teach. But if this were the case, what further structural limitations could those be? There are no additional structural components claimed or disclosed by Applicant that Examiner could identify as contributing to the claimed function. What is it that gives the ability to independently control the first and second tune spaces if not the variable shunt elements and variable RF sources, which are taught in the combination of Nishiyama and Deguchi? What is the difference between the inventive and non-inventive match circuits tested in the declaration that causes them to perform differently? Examiner remains unable to answer these questions in any way that would point to the *nonobviousness* of the claimed invention. Examiner must conclude that the combination of Nishiyama and Deguchi, by teaching all of the structural limitations of the claimed invention, must be structurally capable of performing the same function.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Maureen G. Arancibia/

Examiner, Art Unit 1792

Conferees:

/Parviz Hassanzadeh/

Supervisory Patent Examiner, Art Unit 1792

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/Jennifer Michener/

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